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On a Fixed System of Star Coordinates.

By R. H. M. Bosanquet, F.R.S.

Polaris is taken as pole of a system of coordinates. The distance of any star from *Polaris* is one coordinate (D). Great circles are drawn through *Polaris* and other stars, one of which (ε *Orionis*) is taken as starting-point. The angle at *Polaris* between any of these great circles and the one through ε *Orionis* is the other coordinate, and is called the ascension (A).

If consistent positions of the stars concerned are given in any system of coordinates, the *Polaris* distance and ascension can be found. Where the given places are equatorial, the work has been reduced to the determination of small quantities for stars of moderate declination; and the calculation can be carried to the third decimal of 1″ with ordinary logarithms by a short process.

The following places of *Spica* are from a list reduced from the various catalogues. The annual change is by comparison with the Bradley place; the number for 1900 by the annual change.

α Virginis.

Mean Places.	A. 117° 12′	Annual Change.	1900.	D. 101° 51′	Annual Change.	1900.
	″	″	″	″	″	″
Auwers' Bradley, 1755	50·16	...	...	51·67	...	...
Greenwich, 1880 ...	43·90	−0·050	42·90	54·79	+0·025	55·29
Radcliffe, 1890 ...	43·05	−0·053	42·52	54·23	+0·019	54·42
Nautical Almanac, 1895	43·18	−0·050	42·93	55·08	+0·024	55·20

The annual changes form the basis of a discussion of proper motions. The selection of ε *Orionis* is connected with this.

As to the places of the list for 1900. The *Nautical Almanac* places agree with the Greenwich, as they should. The Radcliffe and Greenwich have little or no average difference in A; but the Greenwich *Polaris* distances are always in excess of the Radcliffe.

The same method could be applied directly to the results of observation corrected for refraction and aberration, and interpolated to the same time, if it were not for the insufficient accuracy of single observations of the fundamental stars.

As to the origin of ascension, secondary fundamental stars could be used, which would, in fact, be identical with the clock stars for the most part.

For *Polaris* additional material must be obtained, either by co-operation or observation out of the meridian, or both.

Errors in *Polaris* R.A. affect the results very little.

Assuming that sufficiently accurate places of *Polaris* can be got, the numbers obtainable through the calculations indicated will be directly comparable, as in the above example, without the intervention of precession or nutation.

Two methods are suggested for extra-meridian observations:—

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(1) A fixed instrument for observation of *Polaris*, by means of which continuous observation of high accuracy would be possible.

(2) A transit instrument in a plane through the pole at right angles to the meridian.

The different historical values of the precession are summarised.

The values which have been attributed to the proper motion of *Polaris* in connection with the different precessions are exhibited in a comparable form in *Polaris* coordinates.

Places of the pole of the ecliptic and of the pole are given in *Polaris* coordinates for different dates; also a simple approximate method of dealing with the motion of the pole.

Suggestions are made for the tabulation of the functions which connect two systems of spherical coordinates, whose poles are not far apart, both in connection with the application of the above system to particular stars and as a more general question of spherical geometry.

Note.—The above is a summary of the chief contents of a paper, bearing the same title, which is to be placed in the library of the Society, together with a supplementary paper entitled "On the Star Survey by Fixed Coordinates in the Southern Hemisphere; with a Proposal for Cooperation."

On the Relation between Precession and Proper Motion.

By R. H. M. Bosanquet, F.R.S.

My former paper on a fixed system of star coordinates was based to some extent on the idea that, as changes in the adopted precession had been found desirable in the past, the same might happen in the future. I therefore saw with interest Mr. Stone's paper on the places of Eight Close Southern Polar Stars (*Monthly Notices*, LV., 299), where the argument is that the precession must be right because the residual proper motions are so small.

Now I have for some time been aware that the proper motion of *Polaris* is susceptible of diminution by an increase of the adopted precession; and it occurred to me in examining σ *Octantis*, as a possible pole of a southern star survey, to discuss the proper motion from this point of view. The result is that the proper motion of σ *Octantis* is also susceptible of diminution by an increase of the adopted precession; and the values of the increase of precession required to make the proper motion a minimum are similar in the two cases.

On the other hand 51 *Cephei* (Hev) requires a diminution of the precession, somewhat greater than the increase of the former cases, to make the proper motion a minimum.

These three stars form a system determining, by the combination of their minimum requirements, a precession differing not

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